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Article

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OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

The effect of humanitarian logistics service quality to customer loyalty using Kansei engineering: Evidence from Indonesian logistics service providers

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Abstract: This article identifies the effect of logistics service quality on customer satisfaction and customer loyalty with customer trust as a moderating variable from the context of Indonesian humanitarian logistics providers. In this study, the service quality was provided into three variables, namely the quality of personnel services, the quality of operation services, and the quality of technical services. The conceptual model is generated by introducing three other variables, namely,

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PUBLIC INTEREST STATEMENT

Kansei Engineering is used in product/service production to obtain customer satisfaction by analyzing human feelings and emotions by relating certain feelings and emotions to product/service designs. The use of Kansei Engineering for humanitarian logistics service would provide a different perspective in terms of capturing the voice of customers' perception of relief logistics service quality. The results of previous research on the commercial logistics business show that logistics service quality (LSQ) variables such as personnel service quality, operational service quality and technical service quality have a significant effect on customer satisfaction. However, by using Kansei Engineering on humanitarian logistics, different results were obtained, where the three LSQ variables did not have a significant effect on customer satisfaction.

customer satisfaction, loyalty, and trust as a moderating variable. Eighty respondents completed the formal survey. The pilot test and the structured questionnaire were analyzed using the SPSS 21 and Smart-PLS 2.0 to evaluate the relationship between the variables. The results of this study were accepted three out of eight hypotheses. The personnel service quality has a significant impact on customer satisfaction, customer satisfaction has a significant effect on customer loyalty, and technical service quality has a considerable impact on customer loyalty. The use of Kansei engineering for humanitarian logistics service in this study would provide a different perspective in terms of capturing the voice of customers' perception of relief logistics service quality

Subjects: Ergonomics; Logistics; Operations Management; Supply Chain Management

Keywords: humanitarian logistics; service quality; Kansei engineering

1. Introduction

Logistics is closely linked to the process of planning and managing the flow of material and information. Logistics has the primary objective or mission in the form of arranging for goods to be delivered at the right time, on the right amount, and on the plan from the company to the customers (Casado-Vara et al., 2018; Gianpaolo Ghiani & Musmanno, 2003). The number of logistical needs in Indonesia appears to be constant and predictable every year (BPS, 2019). There are two types of logistics businesses, included commercial logistics and specialized logistics, such as humanitarian logistics. Humanitarian logistics has some functions, such as an effort to deal with natural disasters or an outbreak of the pandemic disease in the form of shipping goods or materials to disaster victims who have an unforeseeable and sudden number of requests. Humanitarian logistics has supply chain networks that should be flexible and adaptable to the destination and the pace of environmental change through the use of existing resources (Li et al., 2008; Zhang et al., 2019).

There are some of the inhibiting factors for humanitarian logistics including the difficulty of accessing natural disaster sites due to volatile post-disaster situations and lack of adequate resources, in particular of human resources (Balcik et al., 2010; Roh et al., 2018). Some other obstacles require about service quality, or good quality of service provided by personnel (Anderson et al., 2018; Juga et al., 2010), quality of operation services (An et al., 2010; Nagurney et al., 2019), and technical service quality (Gunasekaran & Ngai, 2003; Lamb, 2018). These obstacles certainly make it difficult for logistics services to be carried out effectively and efficiently, as well as to determine the amount of storage of goods that are useful for helping victims of disasters.

In terms of the measurement performance indicators, customer satisfaction on products or services provided by logistics service providers (LSP) has an impact on the customers' willingness to reuse the service (El-Adly, 2019). Other studies have also found a model of the relationship between logistical service satisfaction and customer loyalty to use logistical services (Oliver, 1999; Sundström & Hjelm-Lidholm, 2019). Meanwhile, customer intentions and trust in logistics services have a positive effect on organizational performance as measured by customer satisfaction and loyalty of logistics service users (Dubey et al., 2015; Masudin et al., 2018; Setiawan & Sayuti, 2017; Yeon et al., 2019). The importance of the three variables and the relationship between the variables of customer satisfaction, customer loyalty and customer trust make these three variables part of the conceptual model that will be examined in this study.

Previous researches have discussed the issue of humanitarian logistics. Nevertheless, there has been little research that addressed the quality of service in humanitarian logistics using Kansei engineering, even though the quality of service is essential based on Juga et al. (2010), Davras and

Caber (2019), Asad et al. (2016), and An et al. (2010), also Gunasekaran and Ngai (2003). The selection of Kansei engineering as a method in this research was based on the number of things. First, Kansei Engineering functions for translating customer feelings into design specifications (Nagamachi, 2011). Kansei engineering is used in product/service production to obtain customer satisfaction by analyzing human feelings and emotions by relating certain feelings and emotions to product/service designs. Second, the use of Kansei engineering can represent the opinions and expectations of customers and can express customer feeling better than other methods (Chen et al., 2015). Thus, the use of Kansei engineering in this study is expected to capture the voice of customer of relief logistics service in a different perspective.

2. Literature review

2.1. Logistics services quality

According to Kotler (2002), service is an activity offered by one group to another, which is mostly intangible and does not result in any ownership. The production may or may not be related to a single physical component. The operation is carried out with the primary objective of ensuring customer satisfaction and loyalty. Services provided may be provided in the form of convenience, speed, relationship, capacity, and hospitality provided by the attitude and nature of the provision of services to customers.

In the case of commercial quality logistics services, Kotler (2002) explained that service providers pay significant attention to several service characteristics, included: a) intangibility, that is not realized, could not be seen, tasted, felt, and heard before being purchased; b) inseparability (not separated), i.e., services could not be separated from the service provider; services could not be lined up on sales shelves and purchased by customers whenever necessary; c) Variability, i.e., services that are very diverse because it depends on who provides it and when also where it is offered; d) Perishability (which could not be sustainable), that services could not last long, and therefore could not be saved for sale or future use. The long-lasting nature of the service is not a problem if the demand is constant because previous services could be easily arranged in advance; if demand fluctuates, service companies will face various difficult challenges (Moeller, 2010).

Characteristics in the services of modern logistics service providers were developed by Hirata (2019), who discussed the most three important variables for achieving customer satisfaction. They are the process of digitizing all the information that exists in all existing logistical operations, the quality of personnel working at service providers, and the quality of customer service provided by service providers to customers.

In the service quality sector, Morton et al. (2016) identified objective variables measured through customer perceptions regarding their expectations (subjective component) as the main components of logistics service quality (LSQ). The study states that the importance of service frequency, availability, reliability, and stability will increase the satisfaction felt by customers. Other reviews by Morton et al. (2016) and Millen and Maggard (2010) consider LSQ as the difference between the services expected and those obtained by customers. This makes the quality of service easy to change because it is varied in each place and time. Valarie et al. (1996) and Farooq et al. (2018) argued that customer satisfaction is influenced by the quality of services provided by a company. In other words, two main factors affect service quality, namely expected service and perceived service (Parasuraman et al., 1985; Wang et al., 2019). When the service received or understood (recognized service) is in accordance with expectations, then the quality of service is known as good and satisfying. But on the contrary, if the services obtained are lower and not as expected, the quality of services is considered weak.

2.2. Humanitarian logistics process

According to I. Masudin and Fernanda (2019), humanitarian logistics has published a variety of articles covering earthquakes and post-disaster physical recovery. Economic recovery is the least

discussed, while long-term recovery is the most widely considered. In 2016–2017, the bulk of the articles on recovery management and the most reviewed papers on long-term restoration were published in 2010–2012. This finding shows that there is still a need to develop understanding and research on the process of disaster management in humanitarian logistics. Humanitarian logistics operate in the humanitarian sector, in the context of managing natural disasters. Humanitarian logistics adapts to every situation. Humanitarian logistics must be able to adapt both to the destination and the timing of environmental changes using existing resources (Li et al., 2008; Zhang et al., 2019).

The process that takes place in the logistics sectors relate to procurement activities, demand management, customer service, and customer relations, all to be able to meet customer demand properly (Casado-Vara et al., 2018; Douglas & Lambert, 2000). Logistics operations concentrate on responding to customer requests. In the meantime, several types of research have been conducted in the field of humanitarian logistics to measure performance. Beamon and Balcik (2008), and Roh et al. (2018) believe the importance of the warehouse location for the implementation of humanitarian logistics. These researches show that the supply chain of humanitarian logistics supports the supply chain in the main warehouse (usually located near the airport or port). The product is stored in a permanent warehouse (generally close to the city). At this stage, the same logistic activities as storage, sorting, and shipping activities are completed before the next process takes place. The permanent warehouse for Humanitarian logistics was called a hub before being sent to the local distribution center. Humanitarian logistics inventories are shipped to smaller tertiary warehouses before being delivered to recipients. The length of the supply chain process in Humanitarian logistics is substantially different from that of the distribution of products for commercial purposes, where there is a short supply chain as far as possible. As a consequence of the longer supply chain, the level of customer service is lower.

2.3. Service elements in humanitarian logistics

From the humanitarian logistics process, there are several essential service elements. There are as follows:

2.3.1. Logistics service providers in humanitarian logistics

In humanitarian logistics, LSP has a significant role to play in supporting the smooth process of disaster management in humanitarian logistics. As a significant and deadly tragedy has occurred in Asia, all entities are paying more attention to humanitarian logistics as a research topic that will later become a focus of policy (Kovács et al., 2011). Besides, LSP plays a significant role in the management of natural disasters. With the help of the government, LSP manages natural disasters efficiently. However, the involvement of civilians does not depend on the role and function of the LSP, which helps to handle natural disasters (Sandra Carrasco, 2018). Government, both international and national, and local non-governmental organizations (NGOs) are working to improve the capabilities of the humanitarian logistics division they have. It has happened because the government realizes that humanitarian logistics could not solve its natural disaster relief without the assistance of other parties. Humanitarian logistics service providers perform several tasks, including government procurement, storage, and transport, local non-governmental organizations, and communities affected by other disasters (Fathalikhani et al., 2019; Schulz et al., 2010).

In the stages of natural disaster management, Charter (2008) divides into three stages, namely readiness, response, and counter-measures. The role of LSP at the stage of natural disasters varies depending on the level of involvement in the phase of humanitarian logistics operations. Vega et al. (2015) classify LSP at the stage of natural disasters in Table 1 below:

2.3.2. Humanitarian logistics information system

In the sense of humanitarian logistics, the information system has an important role to play in both enterprise and disaster management. The information system developed in the logistics

Table 1. Role of LSP in humanitarian logistics

	Member	Operator	Actor
Preparation	Logistics service providers are based on Corporate Social Responsibility (CSR) and make donations.	Logistics service providers provide the necessary services in the form of transportation for goods, warehousing for the stock of products owned.	The logistics service provider as 4PL often self-regulates humanitarian logistics in the form of procurement, inventory management, and transportation use.
Response	Facilitating volunteer personnel, both in terms of transportation and warehousing.	Vehicle management, import duties, material movement, logistics center and last mile distribution.	Logistics as a whole, supply chain solutions, as an intermediary between local non-governmental organizations or logistics service providers, coordination with natural disaster response.
Disaster management	Giving and managing donations, humanitarian logistics is responsible for CSR.	Transportation, warehousing, procurement and, humanitarian logistics as a source of ad hoc agreements.	The supply chain for disaster management from local non-governmental organizations or the government. Humanitarian logistics as a strategic business unit.

business is influenced only by the last customer. So that the information structure is easy to construct, based on a logical supply chain hierarchy from the previous customer to the supplier. In humanitarian logistics, the number of requests is based not only on the real needs of customers but also on external service providers and aid providers, both government and local non-government organizations that support the management of natural disasters. It depends on them to prioritize what kind of conditions assistance will be provided by logistics service providers. It is not as easy to predict as a conventional logistics system. The arrangement of information in the disaster management process is essential to provide reliable and accurate information on what is needed, what supplies need to be delivered, and where the location is located (Howden, 2009; Silva et al., 2019).

The information system is vital to support all operations in the field of humanitarian logistics in the areas of transport, storage, and all other logistical activities. The support of this information system is not only technical support but also connects all logistical actors such as the government, donors, NGOs, logistics service providers, disaster communities, and victims of natural disasters. Communication and information are essential things to connect logistics players (Giri & Bardhan, 2014; Masudin et al., 2020), particularly in the field of humanitarian logistics. In the event of natural disasters, information technology could not be operated. All logistic actors must rebuild information systems to link logistics actors to humanitarian logistics and victims so that the maximum benefit is ultimately achieved (Maiers et al., 2005; Silva et al., 2019).

The dimensions of logistics information system such as electronic data interchange (EDI), internet, extranet, and the worldwide web are related to information technology in integrating logistics activities along the supply chain (Lancioni et al., 2000; Masudin, 2017; Wu et al., 2006). Other research on the implementation of information technology made by Tyan et al. (2003) shows that logistics service providers that use collaborative transportation management can reduce total delivery time and shipping costs. According to Gunasekaran and Ngai (2003), four main dimensions should be considered by logistic service providers, including logistics facilities, global network partners, information technology, and quality assurance. Furthermore, Guerlain

et al. (2016) show that logistics service providers, which the use of information systems, can reduce total delivery time, shipping costs, and emissions to the environment.

2.3.3. Humanitarian logistics structure

According to Ottemöller and Friedrich (2019), the logistics structure is very influential in all existing logistical activities. Changes in the logistics structure have a significant impact on the transportation needs of freight carriers. In conventional logistics, the supply chain structure is made as short as possible. This aims to minimize costs and delivery times, inventory parameters (number of items stored), service levels, and efficiency of all existing logistics activities (Gharaei, Hoseini Shekarabi et al., 2019; Kazemi et al., 2018; Moons et al., 2019). The logistics structure in the supply chain is closely related to systematic information management. The logistics structure requires information for an efficient and effective resource recovery process (Chileshe et al., 2019; Kazemi et al., 2018). In logistics activities, it is necessary to find out the number of goods and specifications of the products needed. It also requires customer response to the quality of service provided to find out the extent of the quality of logistics delivery from a company (Guan et al., 2019). Another study by Agi and Yan (2019), who designed coordination on the logistics structure, states that a decentralized supply chain can achieve the best performance compared to other structures. In addition, Taleizadeh et al. (2018) and Gharaei, Karimi et al. (2019) explained that the quality of products in a decentralized supply chain structure is better than the quality of a centralized supply chain product. However, even though the logistics structure has been made in such a way, some unpredictable disruptions are still possible. An unexpected disruption to the logistics supply chain structure is a situation that can have a significant impact on supply chain performance. An evaluation framework proposed by Jessica Olivares Aguila (2019) regarding systemic work to evaluate the logistics structure shows that the resilience index in the logistics structure will be affected by costs related to operations, performance, and the system created.

Apart from being one of the critical factors in the performance of conventional logistics services, the logistics structure is also an essential factor in the operation of humanitarian logistics. Lambert and Cooper (2000), and Karamanos et al. (2017) mentioned that the entire organization must recognize the members of the logistics network structure that they have. In humanitarian logistics, the logistics network aspect has a vital role to play in knowing how long a network structure is required to connect logistics service providers to victims of natural disasters. It influences the decision to use a direct distribution system or a multi-level distribution system. Logistics service providers use their capacity to access and provide support directly to victims of natural disasters through immediate delivery. While in multi-level distribution, humanitarian logistics uses central, regional, and local levels. In multi-level disaster management, it is essential to pay attention to the hierarchy of the supply system, from the quality of logistics service providers to the lower level of logistics service providers or end-customers. In addition to sending goods to low-level service providers (branches), logistics service providers (LSP) could also send goods directly to end customers around the location of service providers. Bi-level optimization model developed by Safaei et al. (2018) and Yin et al. (2016) for distribution networks in humanitarian logistics taking into the uncertainty of demand and supply parameters. This research optimizing the operating costs and consider the penalty for victim dissatisfaction with services provided.

2.4. Customer satisfaction and customer loyalty in humanitarian logistics

One metric of product or service efficiency assessment is customer satisfaction (M. -C.Chen et al., 2011). The level of satisfaction depends on the disparity between the perceived results and expectations. The relationship between the levels of service quality is proportional to the satisfaction of the customer. The greater the quality of the services provided, the higher the satisfaction of the customer. It shows that there is a close relationship between quality of service and customer satisfaction. Therefore, the perceptions of the customer regarding the delivery of excellent service quality by service providers lie behind the different responses in the same sector.

Research on customer satisfaction and loyalty is also relevant to discuss in humanitarian logistics. The time to send logistical assistance to victims efficiently and on schedule is what could cause customer satisfaction and loyalty (Chen et al., 2015). It happened because humanitarian logistics sends emergency goods to victims of natural disasters. Therefore, the fatal consequences if the LSP is late in delivering because their bets are the lives of disaster victims. The items sent to victims of natural disasters include medicines, water, clothing, food, and so on (Nagurney et al., 2019). Safaei et al. (2018) also mentioned the humanitarian logistics with uncertainty in the parameters of demand and supply need to consider optimizing the cost of aid operations as well as penalties for victim dissatisfaction with the services provided. It helps to increase customer satisfaction and loyalty.

2.5. Customer trust of humanitarian logistics

Customer loyalty has been defined by Oliver (1999) and Sundström and Hjelm-Lidholm (2019) because customers' commitment to purchase or reuse a selected item or service remains consistent in the future. Thus, the selection of the same LSP is repeated, even though marketing influences and efforts have the potential to cause a shift in behavior. Customer trust is one of the factors that affect customer loyalty has not been much studied in humanitarian logistics. Nevertheless, research on Big Data analytical skills has been performed. The main objective of this research is to understand how the ability of the Big Data Analysis (BDA) as an organizational culture will improve trust and collaborative success between civilian and military organizations involved in disaster relief operations. The results have four crucial implications. First, BDA has a substantial and significant impact on customer trust and personnel teamwork (Dubey et al., 2019).

2.6. Kansei engineering

The term Kansei is derived from Japanese, which is characterized as a human psychological feeling. The word Kansei was then converted into an engineering method called Kansei Engineering. In 1970, Kansei Engineering was founded by Mitsuo Nagamachi. According to Nagamachi (2011), Kansei Engineering serves to turn customer emotions into design specifications. Kansei Technology system is better able to express customer thoughts than other approaches (Chen et al., 2015).

Kansei Engineering is used in product/service development to achieve customer satisfaction, namely by analyzing human feelings and emotions by linking these feelings and emotions to product/service design. Kansei Engineering uses the following primary methodologies: 1) Selecting a domain, including the selection of specific populations and the determination of research objects; 2) Semantic spatial expansion, this is achieved by gathering a large number of words that define the domain; 3) The synthesis process is the grouping of Kansei words according to the service attributes/dimensions that they affect. Some previous researches on the use of Kansei have been performed to assess the importance of customer sentiment to cross-border logistics services (CBLs) elements to obtain a more appealing CBLs (Hsiao et al., 2017). On the other hand, Yeh and Chen (2018), Restuputri et al. (2020), also Chen et al. (2015) use Kansei Engineering to create logistical services. However, research using Kansei Engineering on humanitarian logistics has never been done.

3. Methodology

The quantitative study is used in this research. The researcher distributes the questionnaires to develop this research using google form. There are three steps in the distribution of questionnaires in this research. The first step is the distribution of pretest questionnaires to recognize Kansei words from customer experience and the reasons for selecting service providers to send disaster relief. The randomly selected respondents in this study were customers or donors who had used humanitarian logistics services at least once. The number of respondents to this pretest questionnaire was 30 (Gay et al., 2011). Therefore, after the data is processed, and the metrics, measurements, and variables are collected, conceptual models and hypotheses are created. The conceptual model consists of 6 variables in which three service quality variables are derived from Kansei words. In contrast, customer satisfaction, customer loyalty, and customer trust variables are derived from previous researches. Besides, the conceptual model was tested with a pilot test that has been carried out by 30 respondents (Gay et al.,

2011). Once the validation and reliability test using SPSS software has been accepted, the distribution of formal questionnaires for further analysis using Partial Least Square-Structural Equation Modeling (PLS-SEM) is continued. The total minimum number of respondents is 10×6 (number of variables) = 60 respondents (Hair et al., 2006). Eighty respondents were listed in this research. Respondents were drawn from all groups that sent aid to natural disasters using logistics service providers. The calculation of the questionnaire in this study is based on a five-point Likert scale of 1 to 5, with ratings used to strongly disagree (1) to agree (5) strongly.

After all the questionnaires have been completed, the findings of the standardized questionnaire are checked for validity and reliability. Validity testing is conducted by monitoring the measurement model, i.e., evaluating convergent validity through-loading factor values, AVE value (average variance extracted), and discriminant validity through cross-loading values. While the reliability test is based on the composite reliability test (Ghozali, 2006; Hair et al., 2016). While testing the structural model with PLS by Nakar et al. (2019) performed with R-square and path coefficients with the following criteria (Table 2):

Table 2. Criteria for evaluating the validity and reliability of structural models

Evaluation of Structural Models		
R ²	R ² value to explain the effect of exogenous variables on endogenous variables	0.67; 0.33; 0.19 indicates “strong”, “moderate” and “weak” models
Path Coefficient	Estimated values for path ties in structural structures may be obtained by bootstrapping processes that also generate T-values (T-statistics)	<ul style="list-style-type: none"> t-table 1.96 (significance 5%) Hypothesis is accepted (there is influence) if t-static \geq t-table <0.15 weak; 0.15–0.45 “moderate”; > 0.45 “strong”

3.1. Recapitulation of Kansei words

In this research with the logistics services domain, 11 Kansei words were collected from a pretest questionnaire, which was completed by 30 respondents. Those 11 Kansei words are a manifestation of the customer’s feelings towards logistics service providers, especially in the field of humanitarian logistics. The 11 terms of the Kansei words are shown in Table 3.

Table 3. Kansei words in logistics services

Kansei words in Logistics Services	
K1 Attention	K7 Responsive
K2 Expert	K8 Accurate
K3 Reachable	K9 Informative
K4 Coordinated	K10 Have Branches
K5 On-time	K11 Systematic
K6 Adequate	

3.2. Formation of operational variables

The 11 Kansei words collected from the pretest concerning service quality are further grouped into dimensions and variables. The basis of this classification is the subjectivity of researchers

and references from several related papers. The dimensions created by the Kansei words are then grouped into variables by looking at the same characteristics. In the meantime, several other variables have been derived from previous researches. The variables of measurement could be seen in Table 4.

Table 4. Measurement variables		
Variable	Dimensions/Attributes	Indicator
The quality of humanitarian logistics personnel services (PS)		PS1: Personnel must pay attention to the services provided PS2: Personnel must be experts in carrying out their duties PS3: Personnel must be easily located or reached by customers (Obtained from Kansei words)
The quality of humanitarian logistics operation services (OS)	Logistics related processes and activities (OS) = mechanism for fulfilling orders or requests, scheduling, efficiency, customer service, procurement, and demand management	OS1: The entire process of disaster logistics activities must be well-coordinated OS2: Delivery of disaster logistical aid must be on time according to the specified schedule OS3: Transport capacity must be sufficient to transport all logistics aid to be sent by customers OS4: Disaster logistics service providers must be able to respond quickly/responsively to customer requests (Obtained from Kansei words)
The quality of humanitarian logistics technical services (IRLS)	<ul style="list-style-type: none"> Information and quality reporting systems (IR) = information systems and data collection, including coordination and control systems, designing and planning, coordinating across organizations for humanitarian logistics service providers. Logistics Structure (LS) = participating in logistics, storage, multi-echelon distribution, and warehousing processes. 	IR1: The information quality provided by disaster logistics service providers must be accurate IR2: The information from disaster logistics service providers must be provided on time IR3: The availability of disaster logistical information that the customer wants LS1: Disaster logistics service providers must have branches in each city LS2: The process of sending disaster relief must be systematic (Obtained from Kansei words)
Customer satisfaction (CS)		CS1: Customers get excellent service CS2: Services and products received are in accordance with the price paid CS3: Service and products make customers feel good (Giri & Masanta, 2020; Juga et al., 2010)
Customer loyalty (CL)		CL1: Customers give a favorable opinion to the logistics service providers and services provided CL2: Customers use the same logistics service provider again CL3: Customers recommend products or services to others CL4: Customers make logistics service providers the first choice (Juga et al., 2010)

(Continued)

Table 4. (Continued)

Variable	Dimensions/Attributes	Indicator
Customer trust (T)		T1: Customers have a right perspective on the logistics service provider T2: Customers recognize the ability of the service provider in the entire logistics process T3: Customers are committed to continuing to use and entrust the whole logistics process to the service provider even if there is a renewal of the logistics process in the future (Marakanon & Panjakajornsak, 2017)

3.3. Conceptual model and hypotheses

The conceptual model is a model that will be used to describe the relationship between quality of service and customer satisfaction and customer loyalty. Besides, the conceptual model is also used to investigate service indicators/dimensions that have the most dominant effect on service quality, so that these findings take the form of service design. There are six variables evaluated with each attribute in this analysis. The relationship between these variables could be seen in the following image:

Figure 1. Humanitarian logistics service quality (HLSQ) conceptual model.

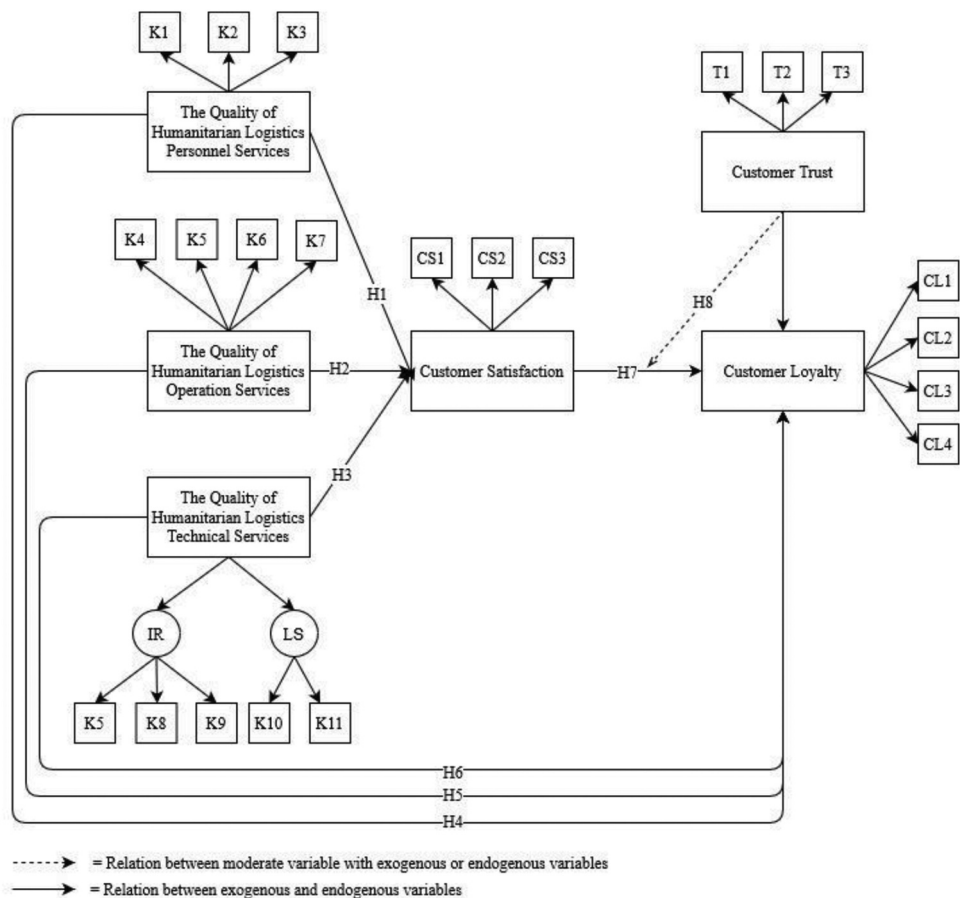


Figure 1 shows the relationship between the quality of service (independent variable), customer satisfaction, and customer loyalty (independent variables). There is a moderating variable in the conceptual model above. A moderating variable is a variable that strengthens or weakens the relationship between one variable and the other. Customer trust is a moderating variable because its presence could improve or undermine the relationship between customer satisfaction variables and customer loyalty. The explanation for the hypothesis is described as follows (Table 5):

Table 5. Logistics services research hypotheses on humanitarian logistics	
Hypotheses logistics services on humanitarian logistics	
H1	The quality of humanitarian logistics personnel services have a significant effect on customer satisfaction
H2	The quality of humanitarian logistics operation services have a significant effect on customer satisfaction
H3	The quality of humanitarian logistics technical services have a significant effect on customer satisfaction
H4	The quality of humanitarian logistics personnel services have a significant effect on customer loyalty
H5	The quality of humanitarian logistics operation services have a significant effect on customer loyalty
H6	The quality of humanitarian logistics technical services have a significant effect on customer loyalty
H7	Customer satisfaction has a significant effect on customer loyalty
H8	Customer trust has a significant effect on customer loyalty

4. Results and discussion

4.1. Pilot test recapitulation

In this step, the function is to find out whether the indicator answers in the questionnaire have been valid and reliable before processing data. The pilot test consists of validity and reliability test. A validation test is used to assess whether the questionnaire answers are correct. The indicators in the questionnaire are considered to be true if the value of R-count > R-table. Testing is done in 2 directions (2-tailed) with α probability of 5%, which means a 5% chance of error in decision making. The value of the R-table is defined as 0.361. Based on the results of the pilot test, it is known that all indicators of each variable R-count value higher than the R-table value. So that all indicators are proven to be valid. The reliability test is used to assess the response of the respondents are constant or not. The test uses a Cronbach alpha. The questionnaire is accurate if the Cronbach alpha value > 0.6. From the result, the reliability test value of all variables is more than 0.6. Every variable is proven to be reliable.

4.2. Processing the formal questionnaire data

4.2.1. Profile of respondents

From the results of the analysis from respondents' profiles (Table 6), it is known that most of them are men with a total percentage of 51% with an average age that is between the ages of 18–25 years.

Table 6. Profile of respondents		
Profile	Number of Respondents	Percentage (%)
Gender:		
Male	41	51%
Female	39	49%
Age:		
18–25 years old	55	69%
26–35 years old	11	14%
36–45 years old	10	13%
>45 years old	4	5%

4.2.2. Descriptive statistics

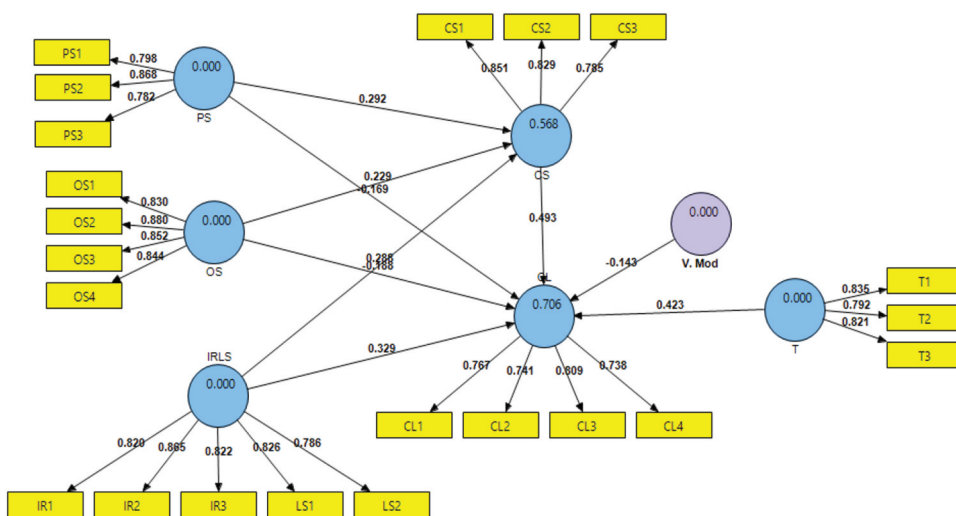
Data of each indicator is described in this section in terms of mean, deviation standard, minimum, and maximum values.

From the descriptive test set out in Table 7, the propensity of the respondents to the mean rating of each variable through its indicators could be seen above. The highest mean value achieved by the variable quality of humanitarian logistics operation services (OS) is 4.24, with a deviation standard of 0.90. It means that the variance is not too large because the degree of variability is less than 30%.

4.3. Analysis of PLS-SEM (Partial least square–structural equation modeling)

Arrows are drawn between latent variables in the diagram signify hypothetical relationships (Figure 2). In the output path diagram displays the loading factor, R-square value, and Path coefficient.

Figure 2. Output diagram of logistics services on humanitarian logistics.



4.4. Test validity

Evaluation of the validity of the reflective model is done by calculating the convergent validity and discriminant validity, which aims to determine the validity of the indicators in measuring variables. In this research, the validity test includes the validity of the loading factor value, Average Variance Extracted, and the cross-loading value. Also, all the analysis is carried out by the roles.

Table 7. Descriptive statistical results

Variable	Indicator	N	Mean Value	Mean	Dev. St	Min	Max
The quality of humanitarian logistics personnel services (PS)	PS1	80	4.20	4.15	0.82	2	5
	PS2	80	4.24		0.86	2	5
	PS3	80	4.00		1.04	1	5
The quality of humanitarian logistics operation services (OS)	OS1	80	4.31	4.24	0.85	1	5
	OS2	80	4.18		0.96	1	5
	OS3	80	4.29		0.84	1	5
	OS4	80	4.18		0.92	1	5
The quality of humanitarian logistics technical services (IRLS): a. Information and system quality reporting (IR) b. Logistics structure (LS)	IR1	80	4.26	4.18	0.98	2	5
	IR2	80	4.14		0.88	2	5
	IR3	80	4.16		0.82	2	5
	LS1	80	4.16		0.89	2	5
	LS2	80	4.16		0.82	2	5
Customer satisfaction (CS)	CS1	80	4.24	4.16	0.93	2	5
	CS2	80	4.05		0.86	2	5
	CS3	80	4.20		0.77	2	5
Customer loyalty (CL)	CL1	80	4.14	4.05	0.91	2	5
	CL2	80	4.05		0.84	2	5
	CL3	80	3.99		0.89	2	5
	CL4	80	4.01		0.86	2	5
Customer trust (T)	T1	80	4.14	4.04	0.88	2	5
	T2	80	4.03		0.83	2	5
	T3	80	3.96		0.88	2	5

4.4.1. Loading factor

Convergent validity is known as through-loading factors. An instrument could fulfill the test of convergent validity if it has a loading factor above 0.6. The results of convergent validity testing are presented in Table 8.

Table 8. Recapitulation of loading factor values

Variable	Indicator	Loading factor	Evidence
The quality of humanitarian logistics Personnel services (PS)	PS1	0.798	Valid
	PS2	0.868	Valid
	PS3	0.782	Valid
The quality of humanitarian logistics operation services (OS)	OS1	0.830	Valid
	OS2	0.880	Valid
	OS3	0.852	Valid
	OS4	0.844	Valid
The quality of humanitarian logistics technical services (IRLS): a. Information and system quality reporting (IR) b. Logistics structure (LS)	IR1	0.820	Valid
	IR2	0.865	Valid
	IR3	0.822	Valid
	LS1	0.826	Valid
	LS2	0.786	Valid
Customer satisfaction (CS)	CS1	0.851	Valid
	CS2	0.829	Valid
	CS3	0.785	Valid
Customer loyalty (CL)	CL1	0.767	Valid
	CL2	0.741	Valid
	CL3	0.809	Valid
	CL4	0.738	Valid
Customer trust (T)	T1	0.835	Valid
	T2	0.792	Valid
	T3	0.821	Valid
Moderation variable (V. Mod)	T1 ↔ CS1	0.793	Valid
	T1 ↔ CS2	0.823	Valid
	T1 ↔ CS3	0.867	Valid
	T2 ↔ CS1	0.775	Valid
	T2 ↔ CS2	0.743	Valid
	T2 ↔ CS3	0.831	Valid
	T3 ↔ CS1	0.702	Valid
	T3 ↔ CS2	0.675	Valid
T3 ↔ CS3	0.708	Valid	

4.4.2. Average variance extracted

In addition to being able to see through-loading factors, it could also be known through Average Variance Extracted. AVE is the “big mean value of square loading of indicators associated with the construction” (Hair et al., 2016). AVE value has a similar meaning to the loading factor value, where the construct must be equal to or greater than 0.5. It means that the design could be explained in a variant by 50 percent or more of the indicators. Besides, the mean variant taken less than 0.5 indicates the occurrence of errors

Table 9. Recapitulation of AVE value

Variable	AVE	Evidence
The quality of humanitarian logistics personnel service (PS)	0.670	Reliable
The quality of humanitarian logistics operation services (OS)	0.725	Reliable
The quality of humanitarian logistics technical services (IRLS)	0.679	Reliable
Customer satisfaction (CS)	0.675	Reliable
Customer loyalty (CL)	0.584	Reliable
Customer trust (T)	0.666	Reliable
Moderation variable (V. Mod)	0.595	Reliable

detected in the option explained in the construct. The results of the convergence validity test are presented in Table 9.

4.4.3. Cross loading

Besides being able to be seen through-loading factors and AVE values, the validity test could also be known through cross-loading. An instrument is valid if it has a cross-loading value of the latent variable with its indicator must be higher than other indicators. The results of concurrent validity testing are presented in Table 10:

4.5. Reliability tests

Composite reliability is the calculation that could be used for the reliability test of the construction. The test criteria state that if the composite reliability is more significant than 0.7, the design is declared to be reliable. The result of the calculation of composite reliability could be seen in the summary presented in Table 11.

4.6. Evaluation of structural models

In this research, the assessment of the inner model includes an analysis of the coefficient of determination (R^2) and path coefficient. All of the studies are carried out in stages.

4.6.1. Determination coefficient (R^2)

The coefficient of determination or R^2 value is commonly used for the evaluation of structural models. The coefficient of determination is determined using the PLS-algorithm, which helps to explain the influence of exogenous variables on endogenous variables.

From Table 12 shows that the R-square variable customer satisfaction (CS) is worth 0.568. It could state that service quality and customer satisfaction can explain the variable CS of 56.8%, and the remaining 43.2% is the contribution of other variables and not discussed in this research.

4.6.2. Path coefficient

In addition, to use the R^2 for the assessment of the structural model, the path coefficient is also used in this research. To get the value of the path coefficient is obtained through the bootstrap process. The value of the direction coefficient ranges from -1.0 to $+1.0$. The path coefficient function is used to determine the relationship between latent variables, which is clarified by the standard coefficient unit of the Hair Jr et al. value (2016). The criterion value for the path coefficient is 3, i.e., 1) if the value is less than 0.15, it is considered to be weak; 2) the value between 0.15 and 0.45 is considered to be moderate; 3) the value greater than 0.45 is considered to be high. The path coefficient recapitulation values are summarized in the following table 13:

Table 10. Cross loading value

	PS	OS	IRLS	CS	CL	T	V. Mod
PS1	0.798	0.621	0.629	0.530	0.517	0.505	-0.309
PS2	0.868	0.707	0.655	0.642	0.470	0.385	-0.291
PS3	0.782	0.581	0.602	0.513	0.218	0.187	-0.059
OS1	0.701	0.830	0.748	0.550	0.489	0.408	-0.312
OS2	0.662	0.880	0.703	0.686	0.472	0.352	-0.322
OS3	0.572	0.852	0.687	0.553	0.489	0.387	-0.285
OS4	0.739	0.844	0.801	0.606	0.436	0.452	-0.150
IR1	0.546	0.649	0.821	0.490	0.510	0.376	-0.248
IR2	0.753	0.781	0.865	0.638	0.536	0.436	-0.214
IR3	0.649	0.716	0.822	0.637	0.585	0.419	-0.140
LS1	0.645	0.678	0.826	0.617	0.506	0.405	-0.103
LS2	0.555	0.721	0.786	0.519	0.431	0.417	-0.158
CS1	0.586	0.613	0.617	0.851	0.618	0.388	-0.310
CS2	0.545	0.553	0.562	0.829	0.654	0.373	-0.232
CS3	0.581	0.575	0.571	0.785	0.478	0.343	-0.300
CL1	0.336	0.353	0.384	0.519	0.767	0.563	-0.411
CL2	0.388	0.450	0.477	0.496	0.741	0.486	-0.259
CL3	0.412	0.446	0.512	0.630	0.809	0.517	-0.277
CL4	0.435	0.447	0.550	0.531	0.738	0.498	-0.174
T1	0.406	0.463	0.455	0.426	0.572	0.835	-0.375
T2	0.255	0.341	0.274	0.322	0.478	0.792	-0.142
T3	0.439	0.336	0.470	0.345	0.593	0.821	-0.049
CS1*T1	-0.348	-0.273	-0.168	-0.313	-0.401	-0.279	0.793
CS1*T2	-0.126	-0.139	-0.072	-0.237	-0.184	-0.041	0.775
CS1*T3	-0.270	-0.232	-0.183	-0.265	-0.211	-0.046	0.702
CS2*T1	-0.173	-0.242	-0.098	-0.232	-0.315	-0.240	0.823
CS2*T2	-0.165	-0.278	-0.192	-0.286	-0.291	-0.160	0.743
CS2*T3	-0.105	-0.058	-0.029	-0.084	-0.135	0.030	0.676
CS3*T1	-0.278	-0.319	-0.230	-0.352	-0.399	-0.356	0.867
CS3*T2	-0.193	-0.255	-0.190	-0.274	-0.186	-0.096	0.831
CS3*T3	-0.202	-0.258	-0.212	-0.147	-0.148	-0.043	0.709

Table 11. Composite reliability value recapitulation

Variable	Composite Reliability	Evidence
The quality of humanitarian logistics personnel service (PS)	0.858	Reliable
The quality of humanitarian logistics operation services (OS)	0.914	Reliable
The quality of humanitarian logistics technical services (IRLS)	0.914	Reliable
Customer satisfaction (cs)	0.862	Reliable
Customer loyalty (cl)	0.849	Reliable
Customer trust (t)	0.857	Reliable
Moderation variable (v. Mod)	0.929	Reliable

Table 12. Recapitulation of R² values

Endogenous variables	R ²
Customer satisfaction (CS)	0.568
Customer loyalty (CL)	0.706

Table 13. Recapitulation the values of path coefficient

Variable	Customer satisfaction (CS)	Customer loyalty (CL)
The quality of humanitarian logistics personnel service (PS)	0.291	-0.169
The quality of humanitarian logistics operation services (OS)	0.229	-0.188
The quality of humanitarian logistics technical services (IRLS)	0.288	0.329
Customer satisfaction (CS)		0.493
Customer trust (T)		0.423
Moderation variable (V. Mod)		-0.143

4.7. Hypothesis testing

Significance testing is used to test whether exogenous variables influence endogenous variables. Test criteria state that if the value of T-statistics is \geq T-table (Hair et al., 2008, 2016). In this research, a significant level of 5% is used so that the T-table = 1.96 is used to assess the considerable influence of exogenous variables on endogenous variables. The findings of the Importance Analysis could be found in the following table:

The results of testing the direct influence hypothesis could be explained as follows:

H1: The quality of humanitarian logistics personnel services (S) have a significant effect on customer satisfaction (CS).

Based on the results of the T-value of the statistics provided in Table 14, the quality of humanitarian logistics personnel services to the customer satisfaction yields a statistical T-value of 2.070, T-statistics > T-table (1.96). This shows that the quality of the humanitarian logistics personnel service is positive and has a significant impact on customer satisfaction. So, if the quality of the personnel service was improved, customer satisfaction will increase.

According to Le et al. (2019), the service quality of personnel has a significant influence on customer satisfaction. The right personnel who pay attention to customers and put themselves in the position and circumstances of the customer could bring customer satisfaction. In the research by Tahanisaz and Shokuhyar (2020), it has been reported that the presence of personnel, etiquette, and the attitude of workers towards customers has been able to influence customer satisfaction. The greatest of staff shows the results, the higher the customer's satisfaction. It was supported by research performed by Sezgen et al. (2019), which states that the ability and performance of personnel is the most critical factor for customer satisfaction. Several other types of research discuss the personnel's attitude to customers. Some of these researches show that workers' attitude toward customers has a significant impact on customer satisfaction. Customer satisfaction would improve along with the personnel's attitude to customers (Alhelalat et al., 2017; Itania & Bert Paesbrughe, 2020; Nesrin et al., 2019).

Table 14. Recapitulation of hypothesis testing

Hypothesis	Relationship description	T statistic	Evidence
H1	The quality of humanitarian logistics personnel services (PS) have a significant effect on customer satisfaction (CS)	2.070	Significant
H2	The quality of humanitarian logistics operation services (OS) have a significant impact on customer satisfaction (CS)	1.040	Not significant
H3	The quality of humanitarian logistics technical services (IRLS) have a significant effect on customer satisfaction (CS)	1.418	Not significant
H4	The quality of humanitarian logistics personnel services (PS) have a significant effect on customer loyalty (CL)	1.731	Not Significant
H5	The quality of humanitarian logistics operation services (OS) have a significant effect on customer loyalty (CL)	1.042	Not significant
H6	The quality of humanitarian logistics technical services (IRLS) have a significant effect on customer loyalty (CL)	2.334	Significant
H7	Customer satisfaction (CS) has a significant effect on customer loyalty (CL)	4.726	Significant
H8	Customer trust (T) have a significant effect on customer loyalty (CL)	1.647	Not significant

In this research, the quality of humanitarian logistics personnel services has a significant impact on customer satisfaction. According to interviews with relevant service providers, the standard of personnel services is the most efficient service offered by service providers to customers. The potential of humanitarian logistics service providers has not been able to match the standard of other services fully. Therefore, respondents' awareness of the importance of quality service to customer satisfaction is very high.

H2: The quality of humanitarian logistics operation services (OS) have a significant effect on customer satisfaction (CS).

Based on the results of the statistical value generated in Table 14, the quality of humanitarian logistics operation services to customer satisfaction yields a statistical T-value of 1.040, where T-statistics < T table (1.96). This shows that the quality of humanitarian logistics operation services does not significantly affect customer satisfaction. The results of this research are supported by

a previous study carried out by Juga et al. (2010), which explains that the direct relationship between the quality of the operation services and customer satisfaction is very weak or insignificant. However, if the quality of the operation services combined with other services quality, it has a significant impact on customer satisfaction. Therefore, it could be seen that the efficiency of service activities does not have the same effect on customer satisfaction as other service quality relationships. Speeds, compliance with the timetable, coordination of all activities are not the main factors that have a significant impact on customer satisfaction.

This finding contradicts some similar research investigating the efficiency of administrative facilities and customer satisfaction. The study concluded that the coordination of all activities or processes and the high standardization of service providers would have a significant impact on customer satisfaction (Usman et al., 2019). According to Santa et al. (2019), the most important factor affecting customer satisfaction is the effectiveness and efficiency of the processes carried out by the service provider. Research conducted by Sun et al. (2005) became one of the investigations contrary to the results of this research. It has been clarified that promoting the presence of a fleet operated by the service provider is the most crucial factor in achieving customer satisfaction. Meesala and Paul (2018) also clarified that the quality of the operation, the swift response of service providers, timeliness, coordination of all processes, and excellent communication with customers have a significant impact on customer satisfaction.

The difference between the results of this research and the previous researches is due to the customer experience factor. Srivastava and Kaul (2014) stated that customer experience in the past is the key to customer satisfaction. However, in the implementation of humanitarian logistics, customers have not received excellent quality service in the quality of the operation service variable. Due to the lack of proper scheduling, good coordination between the parties, high vehicle load capacity, and lack of responsiveness of service providers make the experience of the customer less satisfying. As explained by personnel of logistics service provider that interviewed by the researcher, *"Delivery process of relief goods for disasters in the Java island has been using land vehicles, while in another island used aircraft fleets. The products will be sent to the Airport. But, due to the limited load capacity of the aircraft, there are some requests that we refuse to ship. Delivery time depends on the condition of the natural disaster place. But usually 2 to 3 days. Goods can be sent around two days after the natural disaster happened"*. It ends with the logistics service provider could not reach customer satisfaction. This ends in an insignificant impact on the quality of the operating services on customer satisfaction.

H3: The quality of humanitarian logistics technical services (IRLS) have a significant effect on customer satisfaction (CS).

Based on the results of the T-value statistics produced in Table 14, the variable quality of humanitarian logistics technical services to customer satisfaction yields a statistical T-value of 1.418, where $T\text{-statistics} < T\text{-table}$ (1.96). This indicates that the quality of humanitarian logistics technical services does not significantly affect customer satisfaction. The result of this research is supported by a previous study carried out by Emad Hashiem Abualsauod (2020), which states that there is no relationship between the quality of technical services and customer satisfaction. The use of the latest technology to provide the customer with information is not a consideration that significantly affects customer satisfaction. Another thing that affects customer satisfaction is good interaction between employees and customers.

However, there are several types of research that contradict the results of this research. Hult et al. (2019) explained that service providers who are not in a position to manage information well would not be able to last long. This shows the importance of quality information and quality reporting systems, which must be owned by every service provider available. Souad Djelassia and

Zielkec (2020) agreed that the use of technology as an information tool is crucial for service providers. This is due to the significant effect of the right information on customer satisfaction. Effectiveness in the form of quality of the system, quality of service, quality of information, and operational efficiency has a significant impact on customer satisfaction. In this case, it assumed to be in a position to bring and increase customer satisfaction along with an improvement in the quality offered (Santa et al., 2019). The processes that run systematically according to the schedule and procedures of the service provider are capable of making customers feel satisfied (Usman et al., 2019). Compliance with the timetable and processes means that service providers could fulfill what they have been promised to customers. These actions trigger customer satisfaction feelings. Manuel et al. (2018) states that a system that is fast, systematic, accurate in every way could improve customer satisfaction. By fulfilling some of the criteria above, service providers to make customers feel satisfied with the services they provide.

The difference in the results of this research with previous research is due to the customer experience factor. Srivastava and Kaul (2014) stated that customer experience in the past is the key to customer satisfaction. Nevertheless, the customer has not yet provided the proper technical services. The most striking thing is the consistency aspect of the information and reporting system. To date, service providers have violated the principles of service, in particular concerning the sending of aid. Customers could only deliver relief items without receiving a receipt, and a clear schedule of the goods will be shipped and delivered. Besides, customers are unable to monitor, obtain accurate and timely information. As one member of personnel met the researcher's interview needs, who explained, "*Shippers can only collect their goods here, they do not receive receipts for delivery. They could not even track to what extent the relief items are being sent from them. Whether the goods delivered or not, the sender does not know.*" The shortcomings of these service providers make the experience of the costumers not very pleasant. Since customers have never experienced good quality of technical service, customers could not accept the effect of the quality of humanitarian logistics technical services on customer satisfaction.

H4: The quality of humanitarian logistics personnel services (PS) have a significant effect on customer loyalty (CL).

Based on the results of the T-value of the statistics presented in Table 14, the quality of the humanitarian logistics personnel services variable for customer loyalty results in a statistical T-value of 1.731, where T-statistics < T-table (1.96). This shows that the quality of humanitarian logistics personnel services does not have a significant impact on customer loyalty. It shows the difference between commercial logistics and humanitarian logistics on how the quality of personnel services affects customer loyalty. Research that is relevant to the results of this research explains that the quality of personnel service has only a significant impact on customer satisfaction. But it is inversely proportional to the loyalty of the costumers. The service quality of personnel does not significantly affect customer loyalty (Rod et al., 2016).

The result of this research is contradicting the results of previous studies. Hasiri and Afghanistanpour (2016) explained that personnel factors are essential and have a significant effect on customer loyalty. Characteristics and properties possessed by personnel become the primary triggers. The nature of staff that could trigger the emergence of customer loyalty is care personnel to make customers feel comfortable, the consistency of personnel, flexibility, and suitability shown by the personnel. Sundström and Hjelm-Lidholm (2019) also mentioned the vital role of staff in customer loyalty. In gaining loyalty, there needs to be a good relationship between the customer and the personnel. Therefore, Sundström and Hjelm-Lidholm (2019) mentioned the importance of the recruitment and training process of personnel to obtain excellent quality personnel.

In this research, the quality of personnel services did not significantly affect customer loyalty. The difference in results with most of the previous studies is that customers will not use humanitarian logistics services again just because the personnel is performing well in front of the customers. Customers prefer to consider something more urgent as the speed of delivery of relief goods to victims of natural disasters. According to Vega et al. (2015), humanitarian logistics must be able to take action quickly and precisely under time pressure to send relief items needed by the victims.

H5: The quality of humanitarian logistics operation services (OS) have a significant effect on customer loyalty (CL).

Based on the results of the T-value statistics produced in Table 14, the quality of the humanitarian logistics operation services variable on customer loyalty provides a statistical T-value of 1.042, where T-statistics < T-table (1.96). This indicates that the quality of humanitarian logistics operation services does not have a significant impact on customer loyalty.

The results of this research are relevant to several types of research. Belwal and Amireh (2018) explained that the capacity of fast response or responsiveness of service providers who are part of operations service quality variables do not significantly affect customer loyalty. The level of sensitivity has a shallow effect on customer loyalty. Whether a service provider responds to customer requests or not, it is not a factor that directly affects the presence or lack of commitment of each customer. Results from previous similar research are also essential and compatible with opinions by Belwal and Amireh (2018). Meesala and Paul (2018) explained that the efficiency of the process, rapid response from service providers, timeliness, coordination of all activities, and excellent communication with customers have a significant impact on customer satisfaction. In the meantime, customer satisfaction has a direct effect on customer loyalty. The quality of corporate facilities does not directly affect customer loyalty. The research result from Juga et al. (2010) clarified that the efficiency of service activities combined with the quality of other services has a significant impact on customer satisfaction. It has been reported that the existing metrics on the quality of operation services in the form of organized operations, timeliness in compliance with the current schedule, the ability to respond to requests, and the capability of the vehicle have an impact on customer satisfaction. Therefore, it could conclude that the quality of operation services does not directly affect customer loyalty.

In this research, the quality of operation services does not significantly influence customer loyalty. The difference in results with the majority of previous investigations is due to the experience of the customer (Srivastava & Kaul, 2014). Customers are aware of the importance of service providers reacting rapidly to customer requests. Customers expect that relief could be sent immediately in the case of a natural disaster. Service providers have not been able to do that. Service providers shall receive relief products for several days until the limit has been met. After that, the new service provider submits relief products. The lack of quality of service operations experienced by customers causes customers to believe that the quality of service is not a significant factor in customer loyalty.

H6: The quality of humanitarian logistics technical services (IRLS) have a significant effect on customer loyalty (CL).

Based on the results of the T-value of the statistics generated in Table 14, the quality of the humanitarian logistics technical services variable for customer loyalty results in a statistical T-value of 2.333, T-statistics > T-table (1.96). It indicates that the quality of the humanitarian logistics technical services is high and has a significant impact on customer loyalty. The quality of

technical assistance in humanitarian logistics must be increased to improve customer loyalty. It shows consistency with commercial logistics and indicates that the quality of technical services is one of the factors that influence customer loyalty.

There are several previous types of research that support the results of this research about the influence of humanitarian logistics technical service quality on customer loyalty. According to Zakaria et al. (2014), the availability of online information as an indicator of technical services has a direct and significant impact on customer loyalty. The information is neatly packaged and attractive as a program could raise customer loyalty. Customer involvement is believed to be one of the critical factors in customer loyalty. In the meantime, customer involvement is based on the support for the existence of the website as a source of accurate, timely, and complete information needed (Molinillo et al., 2019). Moreover, De Silva Kanakarathne et al. (2020) explained that customer loyalty affects some industrial structure factors, customer services, and loyalty programs, even though loyalty programs include ease of monitoring, utility, multiple options, and the availability of awards. This research shows the importance of a good logistics system that contains information and online services that are essential to service providers.

According to the results of the pretest questionnaire and formal questionnaire, the majority of respondents suggested that they had selected a provider of natural disaster relief services because of the service provider location was near to the respondent's position. It shows the importance of the service providers' branches in each region. Short distances make it easier for customers to deliver relief goods to the logistics service providers. In addition to providing online information about when service providers open up the delivery of natural disaster relief to affected areas, customers tend to use these service providers again in the future (customers are loyal). It is consistent with the results of an interview with service provider personnel, who said, *"We open donations by uploading notifications through WhatsApp stories. Later, senders usually come to us after that. We typically send goods to the disaster location directly, but for the personnel, it is only our representative. Typically, service providers in Indonesia will be sent to the branch of the service providers to have the closest distance to the disaster location. Subsequently, the group will be responsible for assisting with refugee posts. There are branches in every city."*

H7: Customer satisfaction (CS) has a significant effect on customer loyalty (CL).

Based on the results of the statistical T-value generated in Table 14, the customer satisfaction variable on customer loyalty yields a statistical T-value of 4.726, where T-statistics > T-table (1.96). It indicates that customer satisfaction is high and has a significant impact on customer loyalty. Customer satisfaction must be increased to get higher customer loyalty. It shows the relevant correlation between commercial logistics and humanitarian logistics, that customer satisfaction influences customer loyalty.

Previous researches conducted by several researchers support the results of this research. S.-C. Chen (2012) stated that customer satisfaction directly affects customer loyalty. This positive relationship is influenced by commitment, customer trust, and service provider profits. Suh and Youjjae (2006) explained that customer satisfaction will have an effect on customer loyalty and will contribute to a willingness to not replacing the service providers with another in the future. Customer satisfaction, combined with customer attitudes towards the service provider's brand, will trigger customer loyalty. The research states that customer loyalty is a mixture of customer satisfaction and customer emotional attitudes towards service providers or a brand (Medha Srivastava & Rai, 2018). Castaldo et al. (2016) investigate that the satisfaction of retail customers will directly affect customer loyalty with a moderate degree of influence, and customer satisfaction will have a significant impact on customer trust. The confidence of the customer has a significant positive effect on customer loyalty. In research,

it was noted that customer satisfaction affects activities that are carried out either indirectly or on-line. It is going to end in customer loyalty (Liao et al., 2020).

H8: Customer trust (T) have a significant effect on customer loyalty (CL).

These results of the statistical value generated in Table 14 indicate that the variable customers' trust in customer loyalty provides a statistical T-value of 1.647, where T-statistics < T-table (1.96). This shows that customer trust does not have a significant impact on customer loyalty. It shows the difference between the majority of commercial logistics, which notes that customer trust determines practice. The results of this research are supported by a previous study conducted by Santa et al. (2019) indicates that there is a negative relationship between customers' trust and loyalty. Moreover, the study also claimed that trust has a significant impact on the quality of information, service, and the existing system.

Some previous researches contradict the results of this research. Some earlier researchers stated that customer trust significantly influences customer loyalty. Intan Dewi Savila and Santoso (2019) mentioned that customer trust has an influence on customer loyalty and causes customers' willingness to use the service in the future. The results of this research also contradict the research by Marakanon and Panjakajornsak (2017), which stated that the customer's perspective of the right service provider, as well as the customer's commitment, has an impact on customer loyalty. It will be the end with the desire of customers to reuse the service when they face a similar situation in the future.

Several things could influence the difference in the results of this research with previous researches, one of the differences in the age level. Greiner and Zednik (2019) mention that older people will be easier to believe in doing something repeatedly than younger people. In this research, 55 of the total of 80 respondents are in the range between 18 and 25 years of age. Therefore, it could be inferred that the trust of the respondents will not significantly influence the loyalty of the customer or customer willingness to use the same service frequently in the future.

4.8. Indicators effect on service quality

The loading factor value could be seen to assess the most important predictor. The higher the loading factor, the more efficient the indicator is. Service indicators that have the most significant impact could have a positive impact on service providers. The following service metrics which have the most significant impact on the quality of each service in humanitarian logistics are listed in Table 15:

Table 15. Indicators that have the most considerable influence on each service quality in humanitarian logistics	
Variable	Indicator
The quality of humanitarian logistics personnel services	PS2 Personnel must be experts in carrying out their duties
The quality of humanitarian logistics operation services	OS2. Delivery of logistical disaster assistance must be on time according to the specified schedule
The quality of humanitarian Logistics technical services	IR2. The information from disaster logistics service providers must be provided on time
a. Quality of technical services for humanitarian logistics	LS1. Disaster logistics service providers must have branches in each city
b. Logistics structure	

4.9. Managerial implications and insights

This section consists of the analysis of results and the management implications for humanitarian logistics services. Management implication aims to develop management policies that are expected to make a theoretical contribution to management practices. This research recommends that companies apply service indicators that have the highest loading factor values for each data processing variable. The goal is that the service metrics may have a positive impact on the service provider. Some issues that suggest to humanitarian logistics service providers such as conducting a good recruitment and training process to produce personnel who are experts in work. It was explained by Sundström and Hjelm-Lidholm (2019) that the recruitment process and proper training to obtain a good quality of personnel. A study by Skordoulis et al. (2015) indicated that the method of staff selection method could impact the quality of the employees recruited. The selection method should also consider face to face interviews to get detailed information from the applicants as the purposes of the selection process are obtained.

Another suggestion is regarding do proper scheduling and improving the operating system continuously that makes the process of sending aid to humanitarian logistics could be as efficient as possible. It could be posted on time according to the schedule. Meesala and Paul (2018) and Duan et al. (2018) emphasized that the effectiveness of the process and timeliness, as set out in the plan, must be the responsibility of the service providers. Moreover, replenishment approaches used to maintain the stocks of aids in each warehouse along the supply chain would be crucial to guarantee product availability in a fluctuated demand (Gharaei, Hoseini Shekarabi et al., 2019; Sarkar & Giri, 2020; Shah et al., 2020). These metrics are essential to the recovery of the victims of natural disasters. The earlier the assistance arrives, the more severe the circumstances of the victims.

Moreover, creating and managing online information systems continuously. A good information system shall contain reliable, timely, and complete information by the needs of the customer (Molinillo et al., 2019). Service providers should have a system that is automatically updating information. The ability of the system to provide timely and appropriate information significantly helps humanitarian logistics service providers to gain positive value in front of customers. It is essential to create a website capable of showing the follow-up of the relief items and other information needed by customers. It makes it easy for clients to find out what they want to know as soon as possible.

The availability of branches in each city makes it easy to deliver disaster relief to the victims. Service providers may send natural disaster relief to an office closest to the site of a natural disaster before it provides to the disaster victims. Besides, with each city branch, it is easier for customers to visit one of the customer's closest offices to deliver disaster relief. The availability of branches in each city also contributes more systematically to the process of sending disaster relief. It is suitable for the research of De Silva Kanakaratne et al. (2020), which explains that the logistics structure is one factor for service providers. Therefore, Lambert and Cooper (2000), and Karamanos et al. (2017) explained the importance of service providers to identify branch members of the logistics network structure that they need to simplify and assist in the process of providing disaster relief more efficiently and quickly. In addition, considering the problematic location of the disaster areas, the determination of branch members' sites would be crucial for logistics service providers to improve customer service and responsiveness. Previous studies by Masudin (2017) and Rabbani et al. (2020) investigated the relationships between facility location and service level using deterministic and stochastic approaches. It proves that humanitarian logistics providers could adopt those approaches in determining the relief warehouses or branches.

5. Conclusion

In this research, it could be proven that Kansei engineering can translate customer's feelings and identify humanitarian logistics service quality needed by the costumers. Of the three service quality variables that are commonly used to measure commercial logistic performance, it shows that operation and technical service variables do not affect customer satisfaction when applied to humanitarian logistics. This indicates that customers do not concern about service attributes such as logistics

structure, tracking information technology provided, a mechanism for fulfilling orders, and operating hours in the humanitarian logistics business. However, according to the results of the research, it is known that personnel services can provide a positive influence on customer satisfaction, while customer satisfaction affects customer loyalty. Service providers need the personnel that expert in carrying out their duties. A good recruitment and training process could help to create the expert personnel. In addition to providing timely information, and the presence of branches in each city can influence customer loyalty, service providers could improve the variable quality of technical services to increase customer loyalty. In terms of the relationship between trust and customer loyalty in the study of humanitarian logistics, it indicates that there is no effect between those two variables. In other words, in contrast to the commercial logistics business, the results of this study indicate that customer trust is not a variable that needs to be considered for its effect on consumer loyalty in the humanitarian logistics business.

To increase customer satisfaction and loyalty, providers of humanitarian logistics services in Indonesia could apply the concept of the conceptual model to the design process of humanitarian logistics services. This research has a range of drawbacks and needs to be addressed in future investigations. First, this research uses customers in Indonesia, in particular customers of humanitarian logistics service providers, as respondents, so that the findings may not fully represent humanitarian logistics in other countries. Future research could investigate whether the results of this research are relevant to different regions and respondents. Second, future studies could take other humanitarian logistics services as a research object in different situations, not only for natural disasters but also for infectious disease pandemic (Covid-19) context. Moreover, further studies need to be carried out regarding the humanitarian structure of logistics. The structure and network of facilities that are longer than commercial logistics will affect supply chain activities starting from inventory policy, warehousing, location, and transportation decisions.

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